

PATENT ABSTRACTS OF JAPAN

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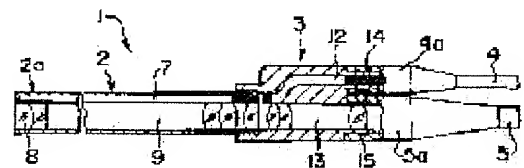
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(54) HARD ENDOSCOPE DEVICE

(57)Abstract:

PURPOSE: To provide the hard endoscope device which is inexpensive and easily handled.

CONSTITUTION: The hard endoscope device 1 is equipped with a shaft 2 as a throwaway hard endoscope main body equipped with the observation optical system and lighting optical system consisting of an objective optical system 8 and a relay optical system 9, an adapter 3 which is fitted detachably to this shaft 2 and equipped with an adapter optical system 13 transmitting an optical image formed by the observation optical system of the shaft 2 and an adapter light guide 12 transmitting illumination light to the lighting optical system 7 of the shaft 2, and a light guide cable 4 which is extended from the adapter 3 almost in parallel to the optical system of said observation optical system and optically connected with the adapter light guide 12 through a connector 4a for adapter connection.



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CLAIMS

[Claim(s)]

[Claim 1]What is attached to a main part of a rigid endoscope provided with an observation optical system and an illumination-light study system characterized by comprising the following for throwing away, and this main part of a rigid endoscope enabling free attachment and detachment

An adapter optical system which transmits an optical image by an observation optical system of this main part of a rigid endoscope.

An illumination-light transmission means which extends almost in parallel with an optic axis of said observation optical system from an adapter provided with an adapter illumination-light study system which transmits illumination light to an illumination-light study system of the main part of a rigid endoscope, and this adapter and which is optically connected with said adapter illumination-light study system.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the rigid endoscope device attached enabling free attachment and detachment of the main part of a rigid endoscope and an adapter.

[0002]

[Description of the Prior Art] the inside of recent years and the abdominal cavity -- thin -- by inserting a long insert portion, the organ in the abdominal cavity is observed or the endoscope to which various curative treatment is made is widely used using the treatment implement inserted into the treatment implement channel etc. if needed.

[0003] The industrial use endoscope is widely used for observation, an inspection, etc. of the crack of insides, such as a body of piping, such as a boiler, a gas turbine engine, and a chemical processing plant, and an automobile engine, corrosion, etc.

[0004] Such an endoscope is whether an insert portion has flexibility, and is divided roughly into an elasticity endoscope and a rigid endoscope. The rigid endoscope of these consists of the eye contacting part by the side of a hand, a light guide base part which projects in the side of this eye contacting part, and a shaft part ahead installed from said eye contacting part.

It comprises connecting a television adapter so that photoelectric conversion of the observation images may be carried out with the image sensor formed in this television adapter and it can also observe by monitor etc., while macro-scopic observation is possible for this eye contacting part, if an eyepiece adapter is connected.

The illumination light is supplied to said light guide cap from this light equipment by connecting the end part of a light guide cable and connecting to light equipment the connector provided in the other end.

[0005] By the way, in the endoscope, especially the endoscope of medical application, in order to prevent infection etc., sterilization treatment fully needed to be performed, but in order to have to perform this sterilization treatment by high temperature high pressure for a long time, there was a problem that the utilization ratio of an endoscope fell. In recent years, the endoscope system which makes said sterilizing process unnecessary is variously proposed by equipping an

endoscope with a disposable sheath and equipping with a new sheath for every analyte in view of this problem.

[0006] If such an idea is pushed further, DISUPO-ization of the endoscope itself can be considered. DISUPO-ization of this endoscope carries out new [of the endoscope itself] for every analyte, and has various advantages, like for that of a potato, though processes, such as sterilization, are naturally unnecessary, it is very clean, and moreover wearing of a sheath becomes unnecessary, and there is no troublesomeness at the time of use in a frog sake.

[0007] Since it has a portion with high costs, such as a curving mechanism, in the case of this DISUPO-izing, said elasticity endoscope is slightly difficult for DISUPO-izing, and if it considers DISUPO-ization, it will be preferred [an endoscope] to it rather to use a rigid endoscope.

[0008]

[Problem(s) to be Solved by the Invention] However, when DISUPO-ization of a rigid endoscope is considered, a light guide base part and an eye contacting part cause a cost hike. If a light guide is lengthened in the vertical direction to the shaft orientations of a scope, while it will be easy to become also structurally complicated and a process will increase, it becomes a cause of a cost hike too.

[0009] This invention is made in view of this problem, it is cheap and handling aims at providing an easy rigid endoscope device.

[0010]

[Means for Solving the Problem and its Function] In order to attain the above-mentioned purpose, a rigid endoscope device by this invention, A main part of a rigid endoscope provided with an observation optical system and an illumination-light study system for throwing away, An adapter provided with an adapter optical system which is attached to this main part of a rigid endoscope, enabling free attachment and detachment, and transmits an optical image by an observation optical system of this main part of a rigid endoscope, and an adapter illumination-light study system which transmits illumination light to an illumination-light study system of the main part of a rigid endoscope, It has an illumination-light transmission means optically connected with said adapter illumination-light study system which extends almost in parallel with an optic axis of said observation optical system from this adapter.

[0011]

[Example] Hereafter, the example of this invention is described with reference to drawings. The side view in which drawing 1 thru/or drawing 3 start the 1st example of this invention, and drawing 1 includes the partial section of a rigid endoscope device, the side view in which drawing 2 shows connection with an adapter, a shaft, and a connector, and drawing 3, A light guide cable and a television code are the side views showing connection with the adapter and shaft which were connected to one.

[0012] As shown in drawing 1, the rigid endoscope device 1 of this 1st example The main part slack shaft 2 of a rigid endoscope, That principal part comprises the adapter 3 which has an optical system connected to this shaft 2 enabling free attachment and detachment, and the illumination-light transmission means slack light guide cable 4 and the television code 5 which are too connected to this

adapter 3 enabling free attachment and detachment.

[0013]While the illumination-light study system 7 is inserted in that inside, the objective optical system 8 is allocated inside the tip part 2a, the relay optical system 9 is allocated behind [optic-axis] this objective optical system 8, and, as for said shaft 2, the observation optical system is constituted including these objective optical systems 8 and the relay optical system 9.

[0014]Such a shaft 2 can be freely detached as mentioned above and attached with a screw thread as opposed to the adapter 3. While this adapter 3 has inserted the adapter light guide 12 for transmitting the incidence illumination light from said light guide cable 4 to the light guide 7 in said shaft 3 in an inside, It has the adapter optical system 13 for transmitting further the object light image relayed to the end face of this shaft 3 by the relay optical system 9 in said shaft 3 to said television code 5. And the light guide end-connection gold 14 for connecting the light guide cable 4 to the end face side of said adapter light guide 12, It protrudes in parallel with the axis of said shaft 2, and is provided, and the television end-connection gold 15 for connecting the television code 5 protrudes on the same axle mostly with the axis of said shaft 2, and is provided in the end face side of said adapter optical system 13.

[0015]Said light guide cable 4 and the television code 5 are respectively connected to said light guide end-connection gold 14 and the television end-connection gold 15 by the connectors 4a and 5a for adapter connection provided in each end.

[0016]Such a rigid endoscope device can be separated into the shaft 2, the adapter 3, the light guide cable 4, and the television code 5 as shown in drawing 2.

[0017]As shown in drawing 3, the television code 5, and the light guide cable 4 and the adapter 3a may be formed in one, and only the shaft 2 may consist of these adapters 3a so that attachment and detachment may become free.

[0018]Next, an operation of this 1st example is explained. The illumination light supplied by the light equipment which is not illustrated is transmitted in the light guide cable 4, via said adapter light guide 12, enters into the illumination-light study system 7 of the shaft 2, and is transmitted to the shaft tip part 2a. And it glares towards a photographic subject from the tip of the illumination-light study system 7. The light figure of the illuminated photographic subject enters via the objective optical system 8, and is transmitted to the hand side by said relay optical system 9. It is transmitted by the adapter optical system 13 of the adapter 3, and enters into the connector 5a for adapter connection of said television code 5, Photoelectric conversion is carried out by image sensors, such as CCD which is provided in this connector 5a for adapter connection and which is not illustrated, It is inputted into the camera control unit which is transmitted and does not illustrate the inside of this television code 5 as an electrical signal, and after performing various signal processing, it is changed into a standard TV signal, and it is inputted into a monitor etc. and observed.

[0019]And after one case is completed, it is good to process so that this shaft 2 may be removed from the adapter 3, and it may be made cancellation disposal or it can collect and reuse.

[0020]According to such 1st example, it becomes possible to become structure with a simple shaft from an adapter by extending almost in parallel with the optic

axis of an observation optical system, and to manufacture a light guide cable comparatively cheaply, and DISUPO-ization of this shaft is attained [in cost or]. Since it processes, such as washing and sterilization, are not only unnecessary, but is lost by this, a user's burden can be reduced more. [of the time and effort of attachment of a sheath etc.]

[0021]The side view in which drawing 4 and drawing 5 start the 2nd example of this invention, and drawing 4 includes the partial section of a rigid endoscope device, and drawing 5 are the partial side views showing connection of a shaft and an adapter.

[0022]As shown in drawing 4, the rigid endoscope device 21 of this 2nd example. The main part slack shaft 22 of a rigid endoscope, That principal part comprises the adapter 23 which has an optical system connected to this shaft 22 enabling free attachment and detachment, and the television light guide code 24 which extends from the hand side of this adapter 23 to one.

[0023]As for said shaft 22, the objective optical system 28 is allocated inside the tip part 22a, While the relay optical system 29 is allocated behind [optic-axis] this objective optical system 28 and the observation optical system is constituted including these objective optical systems 28 and the relay optical system 29, the illumination-light study system slack light guide 27 is inserted in the circumference of this observation optical system at ring shape.

[0024]As shown in drawing 5, as opposed to the adapter 23, it can detach such a shaft 22 with a screw thread and attach freely as mentioned above. This adapter 23 the object light image relayed to the end face of the shaft 22 by the relay optical system 29 in said shaft 22, While having the adapter optical system 33 for carrying out image formation to the image sensors 35, such as CCD furthermore provided back, The adapter light guide 34 too provided in the circumference of said adapter optical system 33 for transmitting the illumination light to the light guide 27 in said shaft 22 at ring shape is inserted in an inside. And the television light guide code 24 has extended back in one on the same axle mostly with the axis of said shaft 22 at the end face side of this adapter light guide 34.

[0025]The end side of this television light guide code 24 has branched to two, the television code 25 and the light guide cable 26, via the tee 24a.

The connector 25a for televisions and the connector 26a for light guides are formed in each end.

[0026]The operation of this 2nd example is the same as that of the 1st above-mentioned example almost. According to such 2nd example, while the almost same effect as the 1st above-mentioned example is acquired, since the television light guide code was provided in one, the operativity of an endoscope improves. Since the light guide is allocated in the circumference of an observation optical system and an adapter optical system at ring shape, even if it forms a television code and a light guide cable in one, the sectional shape cannot be maintained at a perfect circle, and it does not have good flexible nature, and is not necessarily hard to bend in the specific direction. I hear that being made to a round cross section can byway-ize the overall diameter of a code, and there is. When screwing a shaft in a light guide, it is not necessary to adjust rotational quantity and to carry out

alignment of the shaft side light guide and an adapter side light guide, and connection becomes easy.

[0027]As a code of composition of forming a television code and a light guide cable in one, It is also possible the type which puts in ** material and is made into a perfect circle also besides allocating an above-mentioned light guide in ring shape, and to make the code itself into an anomaly and to arrange the signal wire of a light guide and a picture carrier slack image sensor to a different body.

[0028]By the way, if a rigid endoscope has a flexible region, it is difficult to consider it as an airtight structure. For this reason, in order that the conventional rigid endoscope might be made airtight and might make sterilization possible, the observation optical system should be used as the fixed focus, and there should be no flexible region. In this case, zoom and a focus were supported by attaching and using the television camera of a variable focus or a good variable power rate for the hand side of this rigid endoscope.

[0029]However, when expanding magnification with the television camera by the side of a hand in this way, there was a problem that a picture will become dark. When performing expansion of the magnification by such zoom by the objective optical system provided in the tip part, it could carry out, with the luminosity fixed, but this was not able to be performed from the point that it is necessary to hold the above airtightness.

[0030]The rigid endoscope device which zooming and focusing are possible and can moreover carry out prevention from infection without losing a luminosity in view of such a problem is explained with reference to drawing 6 thru/or drawing 8.

[0031]As shown in drawing 6, even if there are few recyclable endoscope bodies 41, the insert portion 41a into a wrap portion. The portion located ahead [of the observation optical system of this endoscope body 41 / optic-axis] is equipped with the container liner 43 in which the convex lens 45 was formed free [longitudinal slide movement], receiving said container liner 43 around this container liner 43 furthermore in the outer case 44 in which the concave lens 46 was formed at the portion of said convex lens 45 of this optic axis located further ahead -- relative -- order -- said -- it has provided free. These outer cases 44 and the container liner 43 serve as a DISUPO sheath which attachment and detachment are free and is exchanged for every case to the endoscope body 41.

[0032]The operation of composition as shown in this drawing 6 can perform the two-point change of magnification by carrying out longitudinal slide movement of the projected part 43a for a slide in which the container liner 43 was formed to the outer case 44 at the hand side to an optical axis direction to perform variable power at the time of observation.

[0033]As shown in drawing 7, even if there are few endoscope bodies 51, the insert portion 51a into a wrap portion. The portion located ahead [of the observation optical system of this endoscope body 51 / optic-axis] is equipped with the sheath 53 in which the concave lens 54 was formed free [longitudinal slide movement], Furthermore, the convex lens 55 which formed in one the spacer 55a which can separate said concave lens 54 and a predetermined interval is dropped and allocated inside [optic-axis] this sheath 53. The illumination-light transmission part 56 which transmits the illumination light transmitted by the light

guide 52 (refer to drawing 8) of the endoscope body 51 to the tip side of this sheath 53 in parallel with the optic axis of said concave lens 54 is formed in this sheath 53.

[0034]The illumination light transmitted by the light guide 52 of the rigid endoscope 51 an operation of composition as shown in this drawing 7, It glares toward a photographic subject via the illumination-light transmission part 56 of the sheath 53 from a tip, and the object light image enters into the observation optical system which the endoscope 51 does not illustrate via said concave lens 54 and the convex lens 55. Under the present circumstances, it carries out by carrying out longitudinal slide movement of the sheath 53 relatively to an optical axis direction to the endoscope 51 to perform a focus. And an object light image is transmitted in the signal wire 58 as an electrical signal, after image formation is carried out to the image sensors 57, such as CCD provided in the tip part of the endoscope 51, and photoelectric conversion is carried out to them, is displayed on a monitor etc. by the focus and is observed by it.

[0035]According to composition as shown in said drawing 6 thru/or drawing 8, though it is a rigid endoscope device which can prevent infection etc., a focus and zoom can be performed by the objective optical system side of a tip part, and it can be considered as the endoscope apparatus with which observation images do not become dark at the time of zoom, either.

[0036]By the way, as a usual endoscope, there are an endoscope for strabisms, an endoscope for side **, etc. other than the endoscope for accepting reality. such an endoscope for strabisms and an endoscope for side ** become expensive by the complexity of the optical system, etc. -- De Dis -- it was difficult to consider it as a POZABURU thing. Since said endoscope for strabisms and the endoscope for side ** were those from which an optical system differs, they were made natural and had turned into a respectively separate endoscope. Thereby, two or more endoscopes needed to be held if needed, and there was a problem that cost started.

[0037]The composition made in view of such a problem is explained with reference to drawing 9 thru/or drawing 11. The endoscope body 61 is the usual rigid endoscope, as shown in drawing 9, has an observation optical system which becomes by the objective optical system 68 and the relay optical system 69, and has the eyepiece optical system 65 in the hand side on the optic axis of this observation optical system. And in accordance with the optic axis of these optical systems, the light guide 67 which transmits the illumination light is inserted in in parallel.

[0038]Such an endoscope body 61 is equipped with and used for the disposable sheath 63 as shown in drawing 10. Even if this sheath 63 has few endoscope bodies 61, it is a wrap thing about the insert portion 62.

The optic-axis winding member 64 formed with material with a transparent section wedge shape is formed in the portion used as the optic-axis front of said observation optical system.

Thereby, an optic axis can constitute the rigid endoscope device of 5 times thru/or the strabism leaning about 10 degrees, for example.

[0039]The illumination light transmitted by the above-mentioned light guide 67 may

also be bent in the direction of a photographic subject by the optic-axis winding member 64, and when the illumination light may be mixed with an object light image and the flare etc. may be generated, the optic-axis winding member constituted similarly may be separately provided for exclusive use in illumination-light transfer.

[0040] If the above-mentioned endoscope body 61 is equipped with and used for the disposable sheath 71 as shown in drawing 11, the endoscope for side ** is realizable. The prism 72 which has the reflector to which it inclined abbreviated 45 degrees to the axis of this sheath 71 is allocated in the tip part of this sheath 71.

[0041] When the rigid endoscope device equipped with the above sheaths 63 or the sheaths 71 is used, the endoscope body 61 can always be maintained at a clean state by exchanging these sheaths 63 and 71 for every case.

[0042] According to composition as shown in said drawing 9 thru/or drawing 11, it is cheap, DISUPO-izing is possible, the endoscope apparatus in which both strabism and side ** are possible can be constituted using the same endoscope body, and it can be considered as a still cheaper and useful thing.

[0043]

[Effect of the Invention] As explained above, according to this invention, it can be considered as the rigid endoscope device in which it is cheap and handling is easy.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a side view in which drawing 1 thru/or drawing 3 start the 1st example of this invention, and drawing 1 includes the partial section of a rigid endoscope device.

[Drawing 2]The side view showing connection with an adapter, a shaft, and a connector.

[Drawing 3]The side view in which a light guide cable and a television code show connection with the adapter and shaft which were connected to one.

[Drawing 4]It is a side view in which drawing 4 and drawing 5 start the 2nd example of this invention, and drawing 4 includes the partial section of a rigid endoscope device.

[Drawing 5]The partial side view showing connection of a shaft and an adapter.

[Drawing 6]The sectional view showing the composition of the rigid endoscope device in which zooming and focusing are possible without losing a luminosity.

[Drawing 7]The sectional view showing other examples of the composition of the rigid endoscope device in which zooming and focusing are possible without losing a luminosity.

[Drawing 8]The figure showing the imaging system and illumination-light study system of an endoscope body which were shown in said drawing 7.

[Drawing 9](A) cross-sectional-view and (B) drawing of longitudinal section showing the endoscope body of the rigid endoscope device which makes strabism and side ** possible using the same endoscope body.

[Drawing 10]The sectional view showing the sheath which makes strabism possible using the endoscope body shown in said drawing 9.

[Drawing 11]The (A) front view, the (B) perspective view showing the sheath which makes side ** possible using the endoscope body shown in said drawing 9.

[Description of Notations]

- 1, 21 -- Rigid endoscope device
- 2, 22 -- Shaft
- 3, 23 -- Adapter
- 4 -- Light guide cable
- 7, 27 -- Illumination-light study system
- 8, 28 -- Objective optical system

9, 29 -- Relay optical system
12, 34 -- Adapter light guide
13, 33 -- Adapter optical system
24 -- Television light guide code

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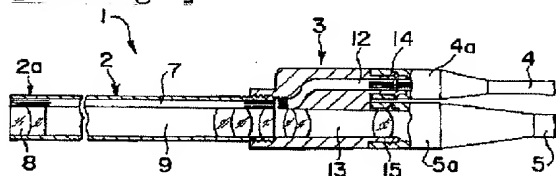
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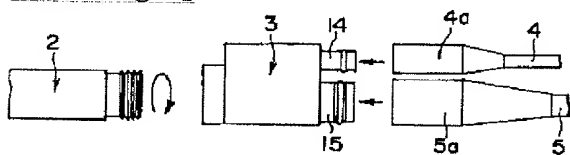
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DRAWINGS

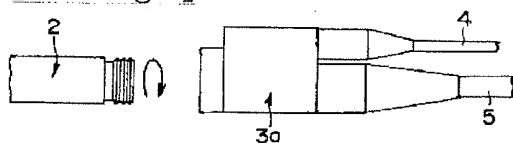
[Drawing 1]



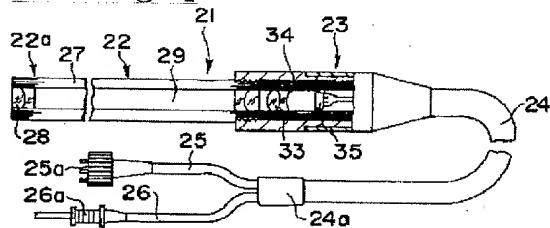
[Drawing 2]



[Drawing 3]



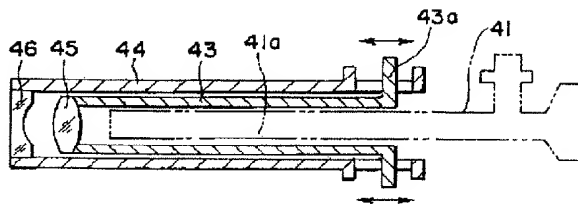
[Drawing 4]



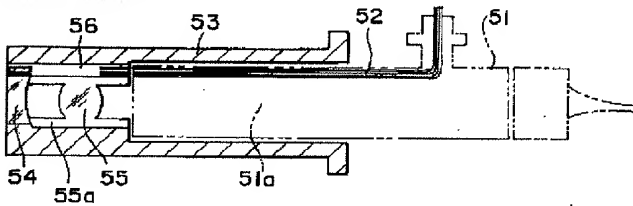
[Drawing 5]



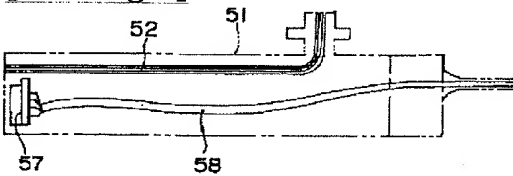
[Drawing 6]



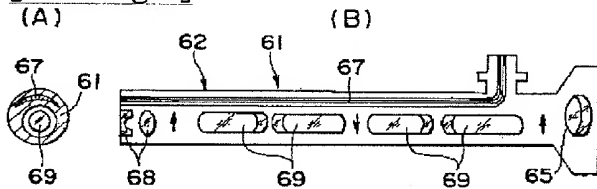
[Drawing 7]



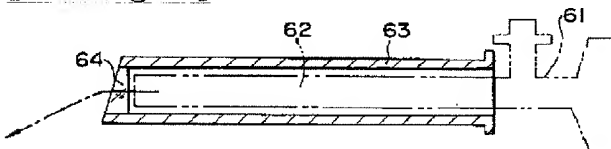
[Drawing 8]



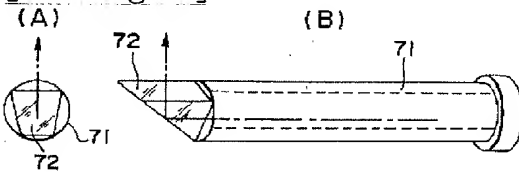
[Drawing 9]



[Drawing 10]



[Drawing 11]



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